DEFENSE MECHANISM EXHIBITED BY LARVAE OF CHRYSOPA CALIFORNICA COQ.

(Neuroptera: Chrysopidae)

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An interesting observation concerning the larval instars of the California green lacewing, *Chrysopa californica* Coq., has been noted at Albany, California, by the writer during the months of April and May, 1948.

Some 5,000 first and second instar lacewing larvae were liberated on a planting of the ornamental shrub, *Pittosporum tobira*, in order to observe their effectiveness as predators on the sunflower aphis, *Alphis helianthi* Monell,[1] colonies of which were just beginning to flourish. The aphis colonies were attended by large numbers of the Argentine ant, *Iridomyrmex humilis* Mayr, which were feeding on the honeydew secreted by the aphids. The ants completed their role as trophic symbionts in serving as protectors of the aphids against parasites and predators.

Most of the lacewing larvae were liberated by dusting them by the hundred onto the shrubs. Several hundreds, however, were liberated individually on the shrubs by means of a camel's hair brush. During the latter procedure an interesting observation was made. When a larva was placed on a leaf which was continually visited by ants, it was immediately susceptible to attack by one or more ants. In coming upon a larva the ant does not hesitate to attack. It makes a quick thrust with its mandibles, securely grasping the abdomen of the larva. The reaction of the larva to attack is immediate. It attempts to bring the tip of its abdomen, which is extremely flexible and can be moved in any direction, into contact with the ant's head. If successful in contacting the ant's head, a fluid secreted from the tip of the abdomen is transferred to the ant. The secretion is extremely repulsive to the ant which instantly releases its hold and begins crawling backwards, rubbing its head on the plant surface in an attempt to rid itself of the substance.

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[1]Determined by E. O. Essig.

In many instances the lacewing larva was not successful in bringing its abdomen into striking position and perished after the ant had bitten it in a malaxatory manner. The dead larva was then either discarded or carried aloft by the ant down the leaves and stems towards the ground. In the latter case, the ant usually encountered others of its species which attempted to assist it in carrying off the dead victim. This resulted in a scramble which found the larva being transferred from one ant to another until it was discarded.

There are several reasons why the lacewing larva succumbs to the ant, the most important being the size of the larva. The newly hatched, unfed first instar larva is the most vulnerable to attack because of its extremely small size and awkwardness. It does exhibit the ability to secrete the repellent fluid, but in attempting to contact the ant's head the larva is handicapped by its small size. The first instar larva which has fed and increased in size is better able to defend itself, though still quite vulnerable to attack. The second instar larva shows a marked improvement over the first in repelling its attackers. Several larvae at this stage were observed to repell as many as 10 to 15 ants, one at a time, over a period of several minutes before finally being overcome. At this stage the larva has gained sufficient size to be able usually to bring its abdomen into effective use. Here again the larger second instar larva is less vulnerable than the smaller second instar larva.

Twenty five third instar lacewing larvae were liberated individually in the same manner as the first and second instars. They were found to be completely invulnerable to the ants. The ant attacks in the same manner as previously described but is at a great disadvantage because the larva is by now much larger than its assailant. When attacked by one ant, the third instar larva is merely disturbed and immediately brings its abdomen into play, giving the ant a liberal application of the secretion. In this case the amount of secretion is enough to repell the ant if placed anywhere on its body. In several instances, where a large amount of the repellant was secreted, the ants apparently became paralyzed for a period of 10 to 15 minutes. When several ants attack, the larva becomes much more agitated and usually drops from the leaf or branch to escape its attackers. If not no easily dissuaded, it may swing the tip of its abdomen in a wide arc, secreting the repellent rather copiously. This procedure usually drives off the

ants. The more tenacious ant, however, even though hit with the repellent, cling to the larva with their mandibles and are dragged along by the larva in its desparate attempt to escape. These ants generally become paralyzed and offer no resistance to the larva. The larva may also bring its mouthparts into use to rid itself of the clinging ants. When a third instar larva, feeding on an aphid, is attacked by an ant, it does not release the aphid but continues to feed, at the same time repelling the ant with the secretion. In no case did a third instar larva succumb to the ants.

BOOK NOTICE

Insect Natural History, By A. D. Imms. Collins, 14 St. James's Place, London. xviii + 317 p., 40 coloured pls., 32 pls. in black and white, 40 text figs., 8 maps. Price 16 shillings. 1947.

This, volume 8 of "The New Naturalist. A Survey of British Natural History," edited by J. Fisher, J. Gilmour, J. Huxley, L. D. Stamp, and E. Hosking, is nothing short of fascinating. The illustrations, mostly by S. Beaufoy, are almost uniformly fine, and the colour plates, especially those of dragon flies, are magnificent. In nearly all cases the insects are shown as live specimens in their natural habitats.

The discussion is centered on the British fauna, but the style is so easy, the subject matter so broad, and the species figured so typical, that the book is equally readable on this side of the ocean. There are chapters on: insect structure and transformations, classification and naming, wings and flight, the senses, feeding habits (2), biological control, galls, methods of protection practiced by insects, reproduction, aquatic insects, social life (2). There is a definite attempt to stimulate the amateur, and references are made to various phases, especially the distribution of species, in which he can provide valuable scientific data.—Hugh B. Leech.